

Appln No. 09/636,000

Amdt date August 19, 2005

Reply to Office action of February 22, 2005

Amendments to the Specification:

Please replace the paragraph beginning on page 4, line 9 with the following:

Once the data burst has been received, the RHS 30 and LHS 20 data may be stored. The midamble 10 is processed to create a model for the channel characteristics that existed when the data burst was sent. The model is made up of a series of L coefficients ~~S_1, S_2, \dots, S_L~~ S_1, S_2, \dots, S_L , which are autocorrelation values of the impulse response of the channel. These coefficients will be used below to calculate the branch metrics used in the trellis processing.

Please replace the paragraph beginning on page 5, line 1 with the following:

Fig. 3 is a diagram showing all possible present states and associated subsequent states for a MLSE having a channel length of $L=4$. In Fig. 3 the MSB is on the right, and the LSB is on the left. As one example, present state number 0, which is the first row in column 310 has the present state of 0000. If the transition bit is a 0, then the path from the present state to the subsequent state follows branch 330, the survivor bit 230 is a zero, and the subsequent state is 0. If the transition bit is a 1, then the path from the present state to the subsequent state follows branch 340, the survivor bit 230 is a zero, and the subsequent state is 0001. Note that if the MSB is written

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on the left, this subsequent state is 1000. In this diagram, all $[[2X2^L,]]$ $2X2^L$, or 32 branches between the 2^L , or 16 present states 310, and 2^L next states 350 are shown.

Please replace the paragraph beginning on page 6, line 27 with the following:

In other words, at completion of the final stage N, the state q_N^{\wedge} with the largest metric at stage N represents the terminating state of the maximum likelihood path among all trellis paths. The predecessor state along the maximum likelihood path at stage N-1 is next obtained as follows. For terminating state q_N^{\wedge} the survivor bit $a_N(q_N^{\wedge})$ is retrieved from memory. The shift register of Fig. 2 is initialized with the terminating state q_N^{\wedge} . Then the shift register contents are shifted left (toward the MSB) and the survivor bit is shifted into the LSB position of the shift register. The resultant shift register content is the predecessor state q_{N-1}^{\wedge} , and the bit a_N^{\wedge} shifted out of the MSB position of the shift register on the left is the last symbol of the maximum likelihood sequence estimate. Next the survivor bit $a_{N-1}(q_{N-1}^{\wedge})$ for state q_{N-1}^{\wedge} is obtained from forward trace memory and again shifted into the LSB position of the shift register and the shift register content is the next predecessor state q_{N-2}^{\wedge} on the backward trace along the maximum likelihood path through the trellis. The bit $[[a_{N-1}]]$ a_{N-1} shifted out of the MSB position is the next symbol of the maximum likelihood data sequence in reverse order. The sequence of survivor bits $a_N(q_N^{\wedge})$, $a_{N-1}(q_{N-1}^{\wedge})$...are thus recursively determined and shifted into the LSB position of the

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shift register and the bits shifted out of the MSB position of the shift register represent the maximum likelihood symbol sequence $a_1^{\wedge}, a_2^{\wedge}, \dots, a_N^{\wedge}$ in reverse order.

Please replace the paragraph beginning on page 13, line 33 with the following:

Fig. 10 shows a more detailed view of the ML receiver subsystem 945 which is configured in accordance of the description by Ungerboeck in Reference 2. ML receiver 945 has a channel estimator 1020, correlator (not shown), matched filter 1030, and MLSE 1080. The received filtered baseband signal 1010 is processed by the channel estimator which generates an estimate of the complex channel impulse response $h(t)$ 1040. The impulse response is time reversed and conjugated to form the matched filter 1030. The filtered baseband signal 1010 is passed through the matched filter 1030 to obtain a matched filter output sample sequence $z_0, z_1, \dots, z_{1070}$ which represent observations for the MLSE. The sample period of the matched filter output sequence 1070 is equal to the coded symbol period of the transmitted digital data 910 in Fig. 9. The correlator computes a discrete time autocorrelation sequence of the channel impulse response $s_0, s_1, s_2, \dots, s_L$, where the autocorrelation sample sequences are spaced in time at the modulation symbol rate. The parameter L is the length of the channel impulse response representing the channel memory. The MLSE 1080 computes the maximum likelihood sequence estimate $a^{\wedge}(0), a^{\wedge}(1), \dots, a^{\wedge}(1090)$ of the transmitted data sequence based on processing of observations $z_0, z_1, \dots, z_{1070}$ and channel autocorrelation

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parameters $s_0, s_1, s_2, \dots, s_L$ 1050. In summary, the MLSE outputs maximum likelihood estimate $a^{(0)}, a^{(1)}, \dots$ 1090 based on input data sources z_0, z_1, \dots 35 1070 and $s_0, s_1, s_2, \dots, [s]$ s_L 1050. It is understood by persons skilled in the art that although the original theory of maximum likelihood receivers as described for example in References 1 and 2, cited below, apply to linear modulations, the theory can be usefully extended to certain nonlinear modulations as well such as GMSK by means of suitable linear approximations.

Please replace the paragraph beginning on page 14, line 31 with the following:

A computational method typically used for ~~the~~ of the MLSE 1080 is known in the art as the Viterbi algorithm and one embodiment of the present invention uses a variant of the Viterbi algorithm which can be summarized as follows. The MLSE operates on the observation sequence z_0, z_1, \dots 1070 which are sufficient statistics, that is, contains all relevant information for maximum likelihood estimation of the transmitted sequence 910. For any hypothesized transmitted sequence a_0, a_1, \dots there is an associated state sequence representation $\dots \sigma_0, \sigma_1, \dots$ where $\sigma_n = [a_n, a_{n-1}, \dots, a_{n-L}]$, and L is the channel memory. Determination of the maximum likelihood symbol sequence is equivalent to determination of the corresponding maximum likelihood state sequence so that the two are mentioned interchangeably.